U.S. Department of Energy - Energy Efficiency and Renewable Energy
Weatherization Assistance Program

The Weatherization Assistance Program enables low-income families to permanently reduce their energy bills by making their homes more energy efficient. During the last 32 years, the U.S. Department of Energy 's (DOE) Weatherization Assistance Program has provided weatherization services to more than 6.2 million low-income families.

By reducing the energy bills of low-income families instead of offering aid, weatherization reduces dependency and liberates these funds for spending on more pressing family issues. On average, weatherization reduces heating bills by 32% and overall energy bills by about $350 per year at current prices. This spending, in turn, spurs low-income communities toward job growth and economic development.

Oak Ridge National Laboratory gives technical support and evaluations.

The Weatherization Assistance Program Technical Assistance Center provides guidance for program operations and fosters community partnerships to advance weatherization.

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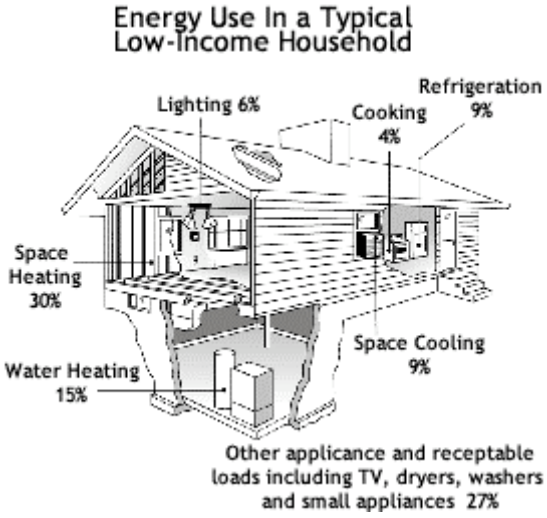
Steady Advance in Weatherization Technologies



Since 1999, DOE has been encouraging the network of weatherization providers to adopt the whole-house approach whereby they attack residential energy efficiency as a system rather than as a collection of unrelated pieces of equipment. *Credit: Economic Opportunity Research Institute 1993) [click on the image to see a larger version.]*

Weatherization technologies include a wide range of energy efficiency measures for retrofitting homes and apartment buildings. Weatherization service providers choose the best package of efficiency measures for each home based on an energy audit of the home.

In the 32 years experience of the Weatherization Assistance Program, these technologies have grown from measures like caulking and weatherstripping to addressing the whole spectrum of energy-consuming systems in low-income homes.

- National Energy Audit Tool
- Insulation
- Blower Doors
- Air Sealing
- Windows
- Heating
- Water Heaters
- Air Conditioning and Warm Climate Weatherization Measures
- Electrical Appliances and Weatherization Base Load Measures
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Energy Efficiency Fact Sheets for Homeowner and Weatherization Recipients

EERE's Buildings Technology Program publishes the following brochure on energy-saving strategies for homeowners:

- Energy Savers: Tips on Saving Energy and Money at home (PDF 429 KB) Download Adobe Reader.
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For Weatherization Service Providers and Energy Professionals

Over the past few years, many weatherization providers have promoted the concept of "whole house weatherization." Under this concept, providers tackle the house as a single energy-consuming system, rather than a loose collection of unrelated systems. Using this approach, these providers can find the best combination of measures for reducing total energy consumption in low-income housing.

You can find a wealth of information about this whole-house approach and about putting the components together to make it happen from DOE publications and Web sites:

- *Single-Family Residential Building Weatherization* (PDF 136 KB) Download Adobe Reader. DOE's Federal Energy Management Program has outlined its approach to whole-house weatherization; 4-pp., September 1998.

Another good source of information is found in the 1993 - 2000 archives of *Home Energy Magazine*.

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Insulation

A worker blows "dense-pack" cellulose insulation into an attic in Indiana. Adding insulation in ceilings and walls is such a common part of weatherization services that more than one crew has taken the nickname "dense pack."
Credit: Cellulose Insulation Manufacturers Association

Adding insulation is a part of almost every weatherization project. Making sure there is enough insulation in the walls, foundation, and roof-anywhere there is a barrier between the home and the outside-is one of the most important ways to make a home energy efficient.

The climatic zone where you live affects how much insulation you should have in your ceilings and walls.

Information for Homeowners Receiving Weatherization Services

- **Adding Insulation to an Existing Home**
  EERE publishes this summary of how to add insulations to existing homes.

- **Loose Fill Insulations**
  DOE's Office of Energy Efficiency and Renewable Energy (EERE) publishes this fact sheet on loose insulations, which is the most common type of insulation used in weatherization to retrofit existing homes.

Some of the following documents are available as Adobe Acrobat PDFs. Download Adobe Reader.

Information for Weatherization Service Providers and Energy Professionals

- **Attic Access: Provide Adequate Insulation Coverage and Air Sealing for the Access Between Living Space and Unconditioned Attic**
  (PDF 1.8 MB)
  DOE's Building Technologies Program publishes this fact sheet as part of its "Building Technologies" series; 4 pp.; February 2000.

- **Basement Insulation: Create a Comfortable Basement Environment That Is Free of Moisture Problems and Easy to Condition**
  (PDF 190 KB)
  DOE's Building Technologies Program publishes this fact sheet as part of its "Building Technologies" series; 4 pp.; January 2000.

- **Insulation**
  DOE's Building Technologies Program publishes this portal (entry Web page) to a large amount of information on insulations; April 2003.

- **Wall Insulation: Provide Moisture Control and Insulation in Wall Systems**
  (PDF 765 KB)
  DOE's Building Technologies Program publishes this fact sheet as part of its "Building Technologies" series; 4 pp.; October 2000.

- **Ceilings and Attics: Install Insulation and Provide Ventilation**
  (PDF 144 KB)
  DOE's Building Technologies Program publishes this fact sheet as part of its "Building Technologies" series; 4 pp.; February 2000.

- **Crawlspace Insulation: Improve Comfort and Increase Durability in the Home**
  (PDF 235 KB)
  DOE's Building Technologies Program publishes this fact sheet as part of its "Building Technology" series; 4 pp.; December 2000.

Blower Doors

The introduction of blower doors to weatherization providers has greatly increased their effectiveness by allowing them to accurately locate the holes in the building envelope where outside air infiltrates indoors.
Credit: David Saum, Infiltec

Blower doors are variable-speed fans equipped with a frame and shroud that permit them to fit inside a variety of doorframes. The instrumentation includes pressure gauges that enable the operator to determine the flow of air through the fan as well as the pressure the fan induces on a dwelling. Since leakier houses require more airflow to induce a given pressure difference, blower doors can measure the relative leakiness of a house.

Blower doors can also reveal the location of many leaks, thus providing a clear target for air sealing. When the job is partially or fully complete, blower doors also provide technicians with quick feedback on the effectiveness of their work. In addition, blower doors can help diagnose which parts of a house do *not* need to be sealed. This allows weatherization crews to focus on the real problems.

Blower door technology has contributed significantly to the evolution of weatherization and building science. Before the advent of this technology and the detailed analysis of patterns of convective energy losses that it allows, most air leakage was thought to occur toward the mid-height of the conditioned building envelope, primarily through doors and windows. Accordingly, DOE and weatherization professionals advocated weatherstripping and caulking in those areas. In fact, blower doors do reveal leaks from doors and windows, although their effects are amplified, since small areas result in high-velocity air currents.

However, leakage from doors and windows represents a relatively small percentage of convective losses in most dwellings, and serious leaks tend to occur at the bottom and especially at the top of the conditioned envelope. As a result of the widespread use of blower doors, weatherization crews increasingly seal the air in attics and basements where most air infiltration into the house takes place.

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Air Sealing

A weatherization service provider applies a seal around an electrical outlet in a home he is weatherizing in northern Alabama.
Credit: Community Action and Community Development Agency of Northern Alabama

Air sealing reduces the flow of outside air into the house and is the common energy efficiency measure under weatherization.

The purpose of air sealing is to reduce the leakage of cold outside air into the house in winter or hot outside air into the house in the summer. Typically, weatherization work crews add caulking and weatherstripping around windows and doors to reduce drafts. Old, drafty homes are not only uncomfortable, but they are also very costly to heat and cool. See stack-effect infiltration in a two-story house to see how this process works.

DOE researchers have discovered, however, that tests using blower doors reveal more precisely the holes in the building envelope where outside air infiltrates into the house. Such holes often occur near the base of the building and near the roof and are unobservable to the naked eye. This DOE research has been largely responsible for the widespread adoption of blower doors as a key diagnostic tool in home energy building science.

Information for Homeowners Receiving Weatherization Services

The following documents provide some background on what weatherization crews are trying to accomplish during air sealing:

- **Home Sealing—Do It Yourself**
  ENERGY STAR® publishes this short Web page for homeowners about how to reduce air infiltration into the home and save energy.

Information for Weatherization Service Providers and Energy Professionals

DOE publishes several fact sheets and a wealth of research on air sealing and the related issue of providing fresh air for ventilation:

- **Spot Ventilation: Source Control to Improve Indoor Air Quality**
  (PDF 255 KB) Download Adobe Reader.
  DOE's Building Technologies Program publishes this fact sheet as part of its "Building Technologies" series; 4 pp.; December 2002.

- **Whole-House Ventilation Systems: Improved Control of Air Quality**
  (PDF 399 KB) Download Adobe Reader.
  DOE's Building Technologies Program publishes this fact sheet as part of its "Building Technology" series; 6 pp.; December 2002.

Windows

The best way to know your windows are as energy efficient as possible is to make sure they have the ENERGY STAR® label.

Information for Homeowners Receiving Weatherization Services

- **Energy-Efficient Windows**
  DOE's Office of Energy Efficiency and Renewable Energy (EERE) Web site contains information about selecting energy-efficient windows and improving the energy efficiency of the windows in your home.

Information for Weatherization Service Providers and Energy Professionals

- **Windows and Doors**
  DOE's Building Technologies Program publishes this series of Web pages with a wealth of information about windows; April 2003.

Heating

Heating systems, such as this furnace in a home in Albuquerque, New Mexico, can consume a large percentage of a family's energy budget. The more efficient the heating system, the lower the energy bill.
Credit: Warren Gretz, National Renewable Energy Laboratory

Weatherization crews discovered that they could more effectively provide long-term savings to many homeowners if they could address heating equipment issues. In some homes, heating equipment is so old and inefficient that replacing it with modern, high-efficiency units is cost effective. Modern controls such as setback thermostats also can save lots of energy over their lifetimes.

Addressing the efficiency of the heating equipment is important in every home, and weatherization crews almost always bring analyzers to check efficiency. They will clean and tune up a furnace or boiler that has not been serviced recently and adjust the controls as a routine part of weatherization.

See the following DOE fact sheets written for energy professionals about heating systems:

- **Combustion Equipment Safety: Provide Safe Installation for Combustion Appliances**
  (PDF 1.0 MB) Download Adobe Reader.
  DOE's Building Technologies Program publishes this fact sheet as part of its "Building Technology" series; 4 pp.; October 2000.

- **Heating and Cooling Equipment Selection**
  (PDF 138 KB) Download Adobe Reader.
  DOE's Building Technologies Program publishes this fact sheet as part of its "Building Technology" series; 4 pp.; January 2002.

- **Right Size Heating and Cooling Equipment**
  (PDF 181 KB) Download Adobe Reader.
  DOE's Building Technologies Program publishes this fact sheet as part of its "Building Technology" series; 4 pp.; January 2002.

Water Heaters

A weatherization service provider installs a low-flow showerhead, a device that reduces the consumption of domestic hot water and reduces energy bills, in a home being weatherized in northern Alabama.
Credit: Community Action and Community Development Agency of Northern Alabama

Almost two-thirds of homes weatherized receive some sort of improvement to their water heating systems. Most have insulation added to the water tank and pipes, and an even larger number receive low-flow showerheads. Reducing the flow of hot water through these low-flow devices is a very effective way to reduce unneeded consumption, and such devices are now commonplace.

For more information, see the following fact sheets about water heating published by DOE and written for energy service providers:

- **Water Heating: Energy-Efficient Strategies for Supplying Hot Water in the Home** (PDF 836 KB) Download Adobe Reader.
  DOE's Building Technologies Program publishes this fact sheet as part of its "Building Technology" series; 4 pp.; August 2001.

Air Conditioning and Warm-Climate Weatherization Measures

Weatherization service providers address cooling systems in homes located in warm climates.

By the 1990s, DOE found that states in warm regions were saving much less energy than states in cold regions because people living in warm climates often spend more money on cooling, and most of DOE's weatherization measures previously addressed heating.

In 1994, DOE issued new regulations, including cooling efficiency measures for homes in warm climates. In some cases, crews provide circulating fans such as ceiling fans that circulate inside air. On other houses, they might include ventilating fans such as attic or whole-house fans that introduce cooler outside air at night.

Work crews are also addressing the inefficiencies in ducts that deliver warm air for heating or cool air for cooling in residential systems. DOE has found that these ducts are often leaky and much less efficient than those in commercial systems. For more information about this research, see the Advanced Air Sealing project summary.

Information for Homeowners Receiving Weatherization Services

Visit the Building Technologies Program Web site to learn how to cool your home efficiently during the hot summer months.

Information for Weatherization Service Providers and Energy Professionals

- **Heating and Cooling Equipment Selection: Care in Selection Is Key to Low-Cost Operation**
  (PDF 90 KB) Download Adobe Reader.
  DOE's Building Technologies Program publishes this Web page on when it is cost effective and how to install a whole-house fan for cooling; 4 pp.; January 2002.

- **Right Size Heating and Cooling Equipment**
  (PDF 181 KB) Download Adobe Reader.
  DOE's Building Technologies Program publishes this fact sheet as part of its "Building Technology" series; 4 pp.; January 2002.

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Electrical Appliances and Weatherization Base-Load Measures

The most effective way to make sure you have the most energy-efficient appliance is to make sure it has the ENERGY STAR® label.

Information for Homeowners Receiving Weatherization Services

- **Buying Energy Efficiency Appliances**
  DOE's Buildings Technologies Program publishes a series Web pages on how to purchase energy efficient appliances using the ENERGY STAR label.

- **Compact Fluorescent Lamps**
  The DOE Office of Energy Efficiency and Renewable Energy (EERE) Web site includes information about the energy-saving benefits of compact fluorescent lamps over incandescent bulbs.

Information for Weatherization Service Providers and Energy Professionals

- **Energy Efficiency Standards for Residential Appliances**
  The DOE Office of Energy Efficiency and Renewable Energy (EERE) Web site includes information about the energy-saving benefits ENERGY STAR appliances.

- **Energy-Efficient Appliances: Selection and Maintenance Guidelines for Major Home Appliances**
  (PDF 779 KB) Download Adobe Reader.
  DOE's Building Technologies Program publishes this fact sheet as part of its "Building Technology" series; 4 pp.; August 2001.

- **How to Read Electric and Natural Gas Meters**
  The DOE Office of Energy Efficiency and Renewable Energy (EERE) Web site includes information about how to read your utility meters